



DD15™ Fuel System Technician's Guide

NUMBER: 08 FSTG-12 **S.M. REF.:** 5.2 **ENGINE:** DD15 **DATE:** October 2008

SUBJECT: ISB VALUES

PUBLICATION: DDC-SVC-MAN-0037

ISB Values and checking have been revised.

ISB (IDLE SPEED BALANCE) VALUES

Incorporated into the MCM is the ISB software which monitors the crank wheel speed variation per segment and compensates each injector to allow a smoother running engine. When the engine is at or around idle speed, the compensation values can be learned and stored in the EEPROM.

For diagnostic purposes these values can be used to pinpoint a cylinder which is getting close to or at its maximum/minimum limit. The limit valves are set to positive (+100) and negative (-100). At the positive value, the MCM software is compensating for an injection rate that is low.

On a common rail system this can be caused by an injector fueling issue or failure of a high pressure supply to a particular injector.

If the ISB values are 0, this indicates no compensation is needed. Values of +40 and -40 are not uncommon for a new fuel system. If values reach +70 to +80 and -70 to -80, injection quantities are reaching their limits and should be noted. If values are at +100 and -100, the respective cylinders should be checked for a failed component.

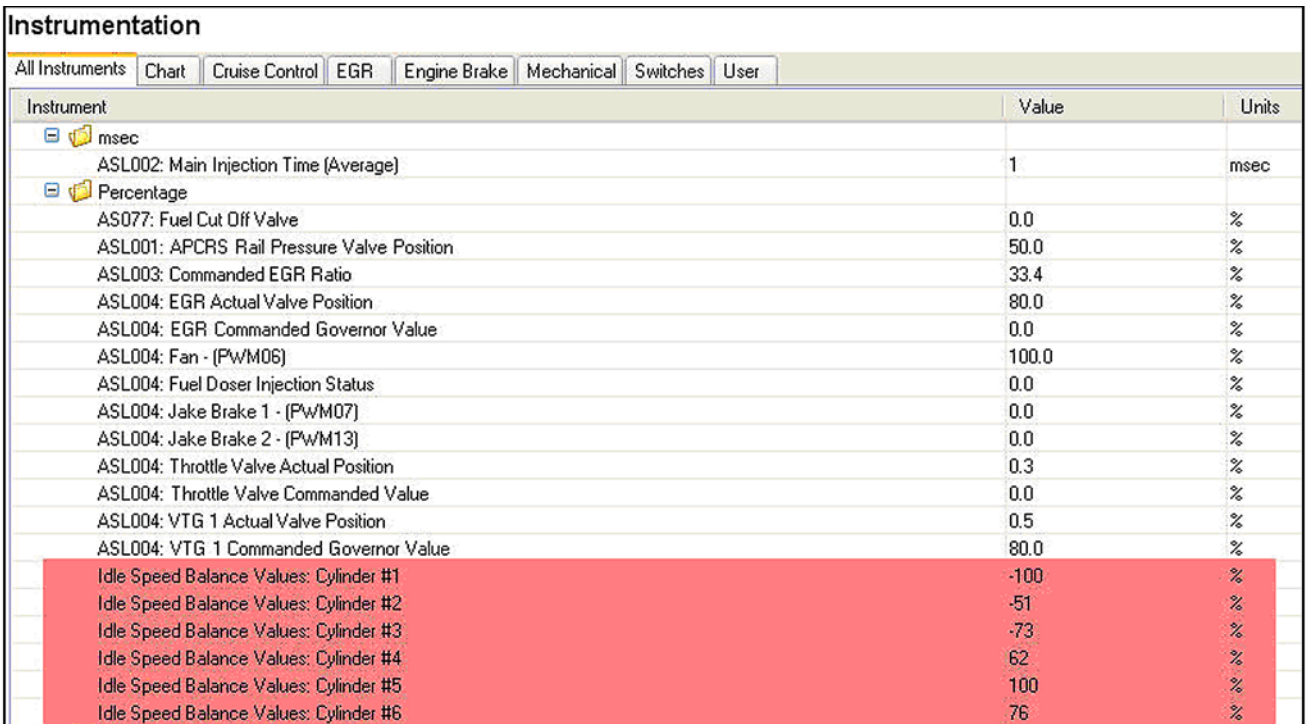
Example: For a low injection rate (low fueling from injector), the software will try to compensate for this injector by increasing its pulse width to smooth out the engine. The value will go positive until the engine is performing properly. If the value reaches (+100), no more compensation can occur. The injector should be replaced only after a visual inspection of the fuel supply to the injector is checked. If the value reaches (-100), this would indicate that the injector is over-fueling to the point that the software cannot take out any more fuel. The injector should be replaced.

Mechanical failure can also cause a +100 or a -100 reading of ISB. Follow all of the troubleshooting procedures for the particular system to determine the root cause of the failure.

CHECKING ISB VALUES

Check as follows:

1. Using DDDL 7.0, go to the “Instrumentation” window and click on the “All Instruments” tab.
2. Scroll down to the “MCM” section and locate the parameters “Idle Speed Balance Values: Cylinder #1” through cylinder 6.



Instrument	Value	Units
msec		
ASL002: Main Injection Time (Average)	1	msec
Percentage		
AS077: Fuel Cut Off Valve	0.0	%
ASL001: APCRS Rail Pressure Valve Position	50.0	%
ASL003: Commanded EGR Ratio	33.4	%
ASL004: EGR Actual Valve Position	80.0	%
ASL004: EGR Commanded Governor Value	0.0	%
ASL004: Fan - (PWM06)	100.0	%
ASL004: Fuel Doser Injection Status	0.0	%
ASL004: Jake Brake 1 - (PWM07)	0.0	%
ASL004: Jake Brake 2 - (PWM13)	0.0	%
ASL004: Throttle Valve Actual Position	0.3	%
ASL004: Throttle Valve Commanded Value	0.0	%
ASL004: VTG 1 Actual Valve Position	0.5	%
ASL004: VTG 1 Commanded Governor Value	80.0	%
Idle Speed Balance Values: Cylinder #1	-100	%
Idle Speed Balance Values: Cylinder #2	-51	%
Idle Speed Balance Values: Cylinder #3	-73	%
Idle Speed Balance Values: Cylinder #4	62	%
Idle Speed Balance Values: Cylinder #5	100	%
Idle Speed Balance Values: Cylinder #6	76	%

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3. If there are any cylinders with a +100 or -100ISB value, run a compression test with DDDL 7.0. Refer to section "Cylinder Compression Test."
 - [a] If all cylinders pass the compression test, go to next step.
 - [b] If cylinder(s) fail, inspect for mechanical failure.
4. Start the engine and bring it up to operating temperature (over 140°F/60°C).
5. Ensure engine is at idle.
6. Monitor ISB parameters making note of each cylinder that is showing a positive or negative 100% value.

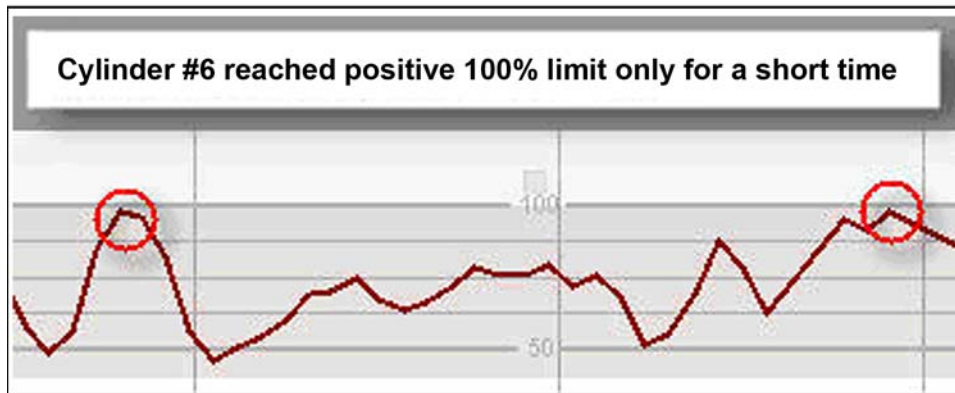
NOTE:

During the learning process some cylinders may reach the positive or negative 100% limit, but will only stay there for a short period of time. Looking at the parameters using the chart function can help determine an injector that is stuck at the 100% limit compared to an injector that reached the limit for a short time.

Instrument	Value	Units	Minimum	Maximum	Descripti
AS100: rpg_i_fmu_act	2700.0	mA	0.0	5000.0	
min-1/s					
ASL002: Engine Speed Acceleration Limitation	0	min-1/s			engine spe
msec					
ASL002: Main Injection Time (Average)	1	msec			electrical c
Percentage					
AS077: Fuel Cut Off Valve	0.0	%			
ASL001: APCRS Rail Pressure Valve Position	50.0	%			position of
ASL003: Commanded EGR Ratio	41.1	%			
ASL004: EGR Actual Valve Position	80.0	%			
ASL004: EGR Commanded Governor Value	0.0	%			
ASL004: Fan - (PWM06)	100.0	%			
ASL004: Fuel Doser Injection Status	0.0	%			dtay type i
ASL004: Jake Brake 1 - (PWM07)	0.0	%			
ASL004: Jake Brake 2 - (PWM13)	0.0	%			
ASL004: Throttle Valve Actual Position	0.2	%			
ASL004: Throttle Valve Commanded Value	0.0	%			
ASL004: VTG 1 Actual Valve Position	0.5	%			booster 2 t
ASL004: VTG 1 Commanded Governor Value	80.0	%			
Idle Speed Balance Values: Cylinder #1	-100	%	-100	155	- 100% C
Idle Speed Balance Values: Cylinder #2	-100	%	-100	155	- 100% C
Idle Speed Balance Values: Cylinder #3	53	%	-100	155	- 100% C
Idle Speed Balance Values: Cylinder #4	52	%	-100	155	- 100% C
Idle Speed Balance Values: Cylinder #5	100	%	-100	155	- 100% C
Idle Speed Balance Values: Cylinder #6	13	%	-100	155	- 100% C

Cylinder #5 ISC at Maximum Positive Value

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NOTE:

If all cylinders have not updated within three minutes, run the engine to 1200 RPM for one minute and return to idle. This will cause the MCM software to relearn the ISB values.

Fill in the following chart with the ISB values. These can be used at a later date or may be required for another procedure.

ISB Worksheet	
Cylinder #	ISB Value
Cylinder 1	%
Cylinder 2	%
Cylinder 3	%
Cylinder 4	%
Cylinder 5	%
Cylinder 6	%

7. Continue to monitor cylinder(s) that reached a positive or negative 100%. If the suspect cylinder is stuck at the limit of positive or negative 100%, check the following components:
 - Fuel line from rail to injector (kinked or plugged). Repair as necessary. Verify repairs and go to step 9.
 - Fuel line connection at injector or rail (leaking). Repair as necessary. Verify repairs and go to step 9.
 - Cranking compression. Repair as necessary. Verify repairs and go to step 9.
8. If a cylinder is constantly higher than +70% or lower than -70% and there are no other mechanical concerns with the engine, change the injector.
9. In the ISB panel, click on the Run Test to reset the ISB Values to 0%. Run the engine until it reaches operating temp and monitor the ISB values.
 - [a] If ISB values are lower than 70% and higher than -70, release the vehicle.
 - [b] If the ISB numbers climb over $\pm 70\%$ look for a mechanical concern in the engine.

ADDITIONAL SERVICE INFORMATION

Additional service information is available in the Detroit Diesel *EPA07 DD13/DD15 Fuel System Technicians Guide*, (DDC-SVC-MAN-0037). The next revision to this manual will include the revised information.

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